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PHYSIOGRAPHIC NOTES.

BY

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THE SHAPE OF THE EARTH.—When William Lowthian Green published his *Vestiges of the Molten Globe*, it attracted practically no attention, and nearly all who gave it any consideration looked upon it as a vague speculation. In England and America his theory has, until within the last year or two, been neglected; but once people began to study it with seriousness, it has been interesting to watch the respectful attention which his theory has received. Gregory's paper, in the *Geographical Journal*, has already been abstracted in these notes. (See Bull. Amer. Geographical Society, Vol. XXVI, 1899, p. 259.)

Now Professor Emerson presents a consideration of the Tetrahedral theory in his address as President of the Geological Society of America. (*Bulletin Geo. Soc.*, Vol. XI, 1900, pp. 61-106.) As a whole, Emerson seems to favor the hypothesis proposed by Green. He considers with Green that this tetrahedral theory accounts for the triangular shape of the continents pointing southward, and of the oceans pointing northward, and that it also accounts for the fact that in general the land is antipodal to the water.

One of the difficulties which Green encounters in his attempt to explain the larger earth-forms is the fact that the southern continents are not in exactly the position that they should be upon the theory. Moreover, between the southern and northern continents is a zone of depression and of mountain-folding, represented by the West Indies, the Gulf of Mexico, and the zone of disturbance in the neighborhood of the Mediterranean and, east of this, in the neighborhood of Southern Asia. This "zone of intercontinental seas" serves Emerson with an opportunity for considerable discussion. Green accounts for it as being a plane of weakness along which a shifting took place, as along the twinning plane of a crystal, with the result of throwing the southern continents out of line. Emerson suggests the alternate speculation, that when formed the zone of fracture was in reality the equatorial zone. In the course of further cooling of the globe the equator and pole were shifted to their present position.

It is impossible in a brief space properly to summarise Emerson's paper, but any one interested in speculation concerning the origin of earth-form will find here much food for thought.

ANCIENT GLACIERS IN THE SIERRA COSTA OF CALIFORNIA.—Little by little we are gaining information concerning the form of glaciation in the mountains of the West. A recent paper by Hershey (*Journal of Geology*, VIII, 1900, pp. 48-57) describes the evidences of individual glaciers among the Sierra Costa mountains of northwestern California. Aside from his description of the evidences of glaciation, there are one or two points worthy of note. He finds that the valleys which were occupied by the ice show distinct signs of their occupation in several ways. The talus material has been removed from the valley sides. The valleys have been smoothed and given rounded slopes, with gently rounded floors, thus becoming U-shaped. In the course of this glacial erosion many of the side ravines have been destroyed, partly by grinding back, partly by deposit in the valleys.

At first Hershey thought he had found signs of two glacial epochs, one much older than the other; but further study has led him to the conclusion that this evidence is not valid. The deposits near the end of the glaciated valleys are slightly older in appearance than those near the heads of the valleys. It is a question that has often arisen in my own mind whether a considerable amount of the so-called ancient drift of the first glacial epoch is not in reality material of residual decay pushed to the edge of the ice during its earliest advance.

In Hershey's opinion an elevation of three thousand feet would be sufficient at present to cause reduplication of the ancient glaciers, and he seems inclined towards the belief that this is the only explanation of the glaciation of this region.

EVIDENCE OF GLACIAL EROSION OF LOCH LOCHY, SCOTLAND.—While for a number of years glacial geologists have been rather averse to the admission that glaciers have done distinctly important work in erosion, it is interesting to note that there seems now a tendency in many directions to accept the evidence—which is very clear—that the glaciers have eroded certain surfaces very perceptibly. Blanford (*Quarterly Journal, Geological Society*, LVI, 1900, pp. 108-204) calls attention to the evidence of glacial erosion which he has noticed in Loch Lochy. The valley side is a sloping plain, and the tributary valleys to this, which are quite pronounced higher up on

the hill-side, are entirely absent near the base of the hill-slope. Blanford's explanation of this condition is that the passage of the ice through the valley planed back the hill-slope so far that the tributary valleys were erased near their lower ends. Something of this same sort may also be noticed in the longitudinal valleys of central New York, as, for instance, the valley of Lake Cayuga; but here, while lateral erosion has doubtless been one cause, valley-deepening has certainly been an even more important cause for the peculiarity which Blanford describes. (See Tarr, *Bull. Geol. Society Amer.*, V, 1894, p. 339.)

Another point of importance in Blanford's brief paper is his consideration of the evidence furnished by the small lateral gullies which have been eroded in the glacial deposit that veneers the hill-side. These, he points out, are entirely post-glacial. They are quite pronounced. And it would be a simple matter for careful study to use their present rate of erosion in making an estimate of the time since the ice withdrew. Blanford is impressed by the fact that these gullies cannot have required a very long time for their formation. His own conclusion is that which many others have adopted from evidence elsewhere—that an estimate of 10,000 years is probably nearer the truth than the longer estimates for post-glacial time of some of the workers.

It is to be noted that while an estimate of the present rate of erosion, as proposed by Blanford, will, of course, be of value, it could not be taken as an exact basis for a conclusion as to the number of years since the glacial period, because there are modifying factors. During the greater part of the time since the glacial period these hill-slopes have had the protection of vegetation, now removed. Moreover, the amount of water supplied by the melting of the ice and snow, and possibly even by heavier rainfall, may have been much greater at an earlier time than now.